

Geography – Background Information – Policy

Best-fit and Exact-fit

Introduction - Building brick geography

There are two key building brick geographies; postcodes and census output areas (which are built up from postcodes). The National Records of Scotland (NRS) Postcode Index assigns postcodes to higher geographies via the grid reference of the postcode whereas census outputs assigns statistics to higher geographies via the grid reference of the master postcode of the census output area. In each case the higher area assignment is carried out using 'Point in Polygon' method, the only difference is the building brick geography being used.

This means that higher areas created from the allocation of output areas may differ from the equivalent higher areas created from the allocation of postcodes from the NRS Postcode Index. This is because the whole output area including all its constituent postcodes is assigned to a higher area based on the master postcode.

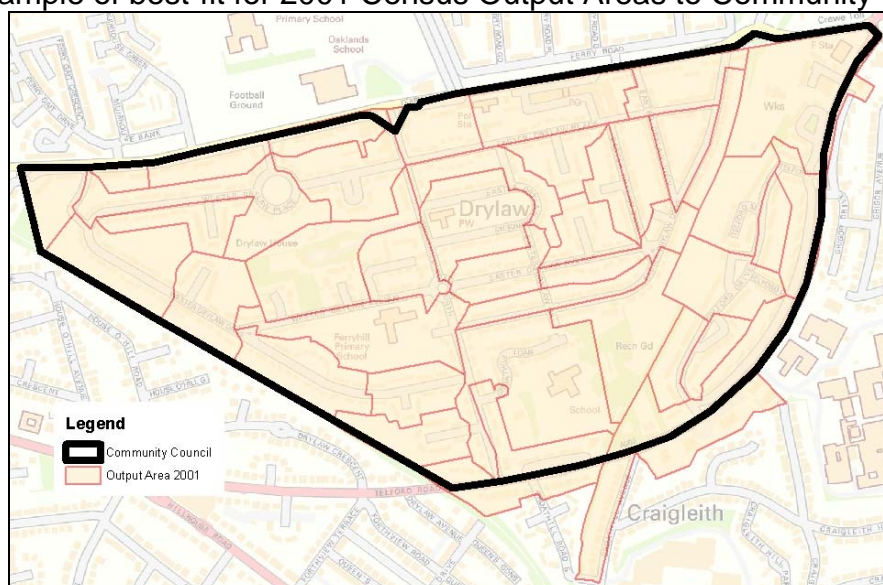
More information on master postcodes can be found in the 2011 Census Geography Background Information note within the [2011 Census Supporting Information](#) section of the NRS website.

The assignment of postcode or output area to any higher geography is either a best-fit or an exact-fit. For example assigning a postcode to an output area or an output area to a council area is an exact-fit, whereas assigning a postcode or an output area to a health board or an electoral ward is a best-fit.

Definition of best-fit and exact-fit

Best-fit simply means that when postcodes or output areas are aggregated and assigned to a higher geography, they do not fit exactly into the boundary of the higher geography; instead they form an approximation to the shape of the boundary of the higher geography.

Example of best-fit for 2001 Census Output Areas to Community Council Area

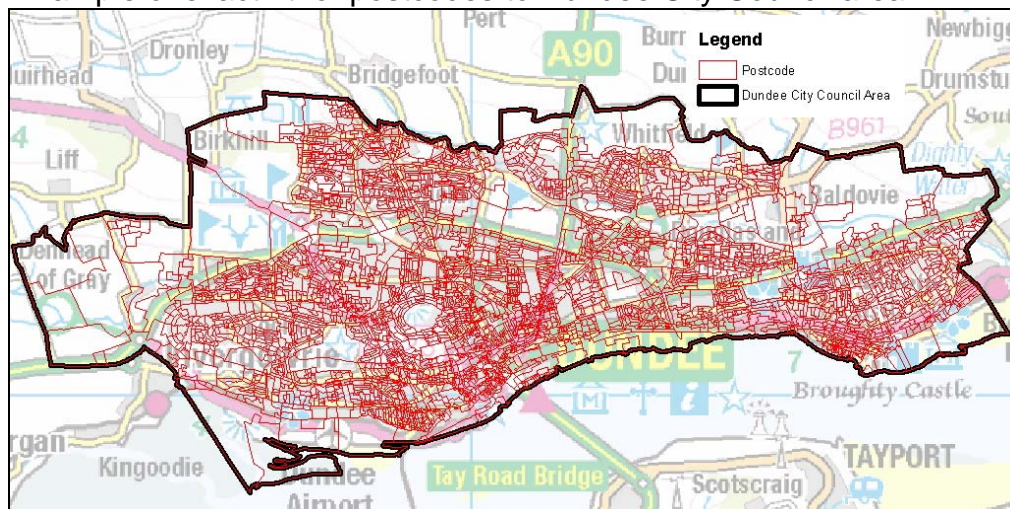


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Exact-fit means that when postcodes or output areas are aggregated and assigned to a higher geography, they fit exactly into the boundary of the higher geography.

Example of exact-fit for postcodes to Dundee City Council area

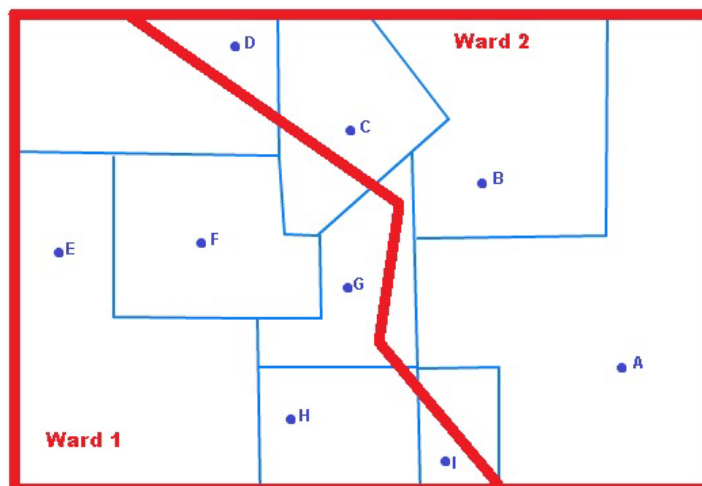


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Assigning postcodes to higher geographic areas

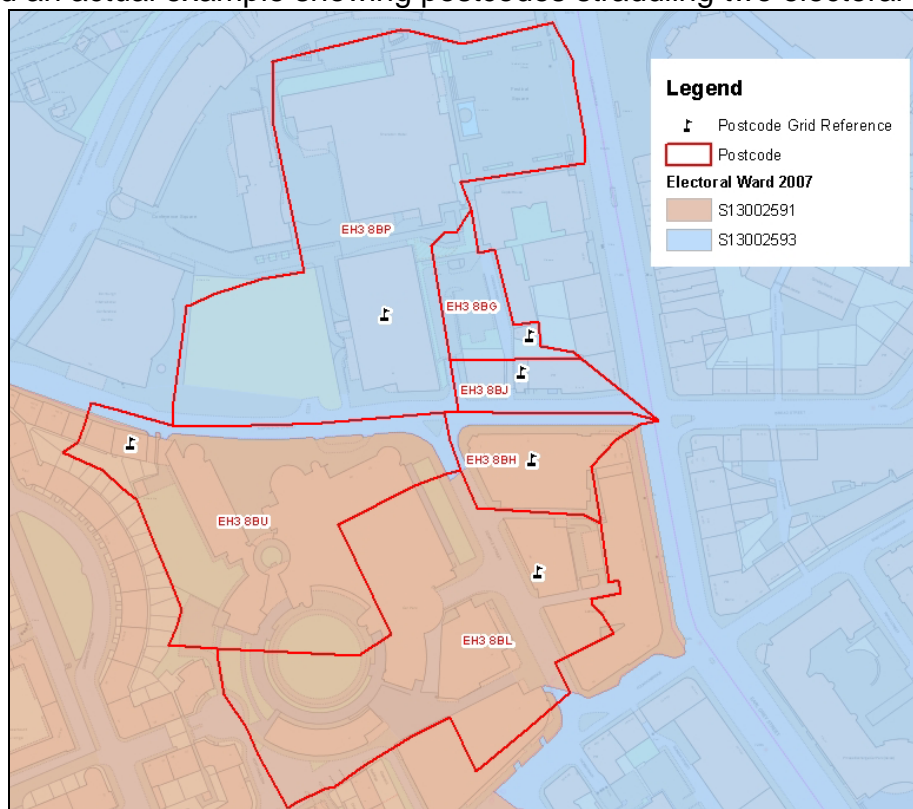
In the diagram below we have postcodes labelled A to I and wards labeled 1 and 2. Some postcodes straddle the ward boundary, so have addresses within both wards. A postcode, and all the addresses contained within it, is assigned to one ward only based on the geographic position of the grid reference of the postcode, not the polygon shape or size. The postcode is assigned its ward value using a 'Point in Polygon' method. In this example, the point in polygon results are:

Ward	Postcode
1	E to I
2	A to D



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And an actual example showing postcodes straddling two electoral wards



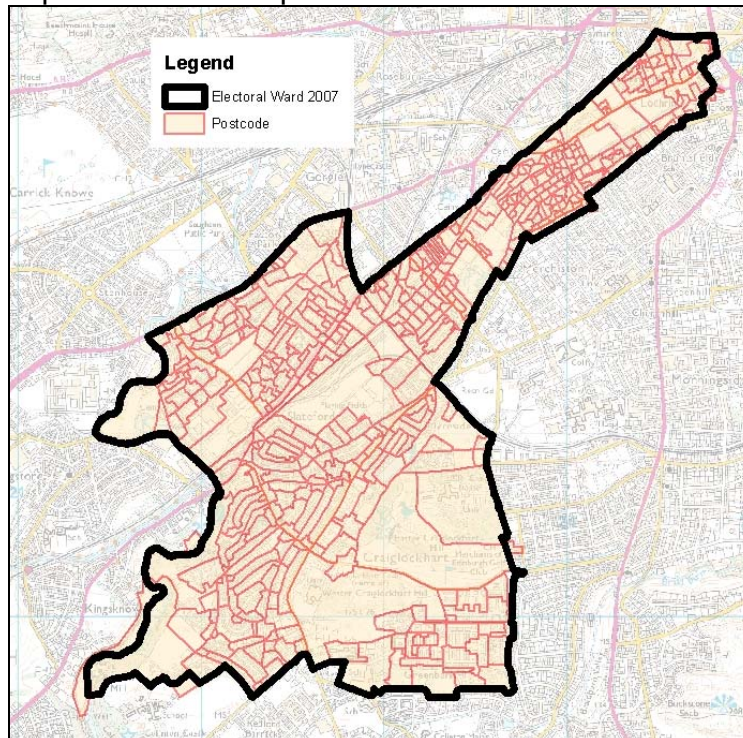
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Postcode	Electoral Ward 2007
EH3 8BH	S13002591
EH3 8BL	S13002591
EH3 8BU	S13002591
EH3 8BG	S13002593
EH3 8BJ	S13002593
EH3 8BP	S13002593

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If all the postcodes assigned to electoral ward S13002591 were grouped together they form a shape close to the shape of the true ward, i.e. it will be best-fit.

Example of best-fit for postcode to Electoral Ward 2007



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Best-fit and Exact-fit

Exact-fit

For statistical purposes, postcodes are amended to fit exactly into council areas. National Records of Scotland (NRS) digitise postcode boundaries which cross council area by splitting the postcode along the council area boundary to create separate postcode records. These split parts are identified with an 'A', 'B' or even a 'C' suffix at the end of the postcode.

More information on postcodes can be found in the Postcode Background Information note within the [NRS Postcode Extract](#) section of the NRS website.

Why can't everything be exact-fit?

If all statistics produced were published as exact-fit for a number of geographies, there could be overlap and confidential information could potentially be released about small populations in the overlap or 'sliver'.

More information on potentially disclosive slivers can be found in the 2011 Census Geography Background Information note within the [2011 Census Supporting Information](#) section of the NRS website.

What happens with large user postcodes?

A large user postcode that has been linked to a small user postcode takes on the higher area attributes of that small user postcode.

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Policy for 2011 Census

Statistical output from the 2011 Census will be exact-fit for 2011 Output Area (OA) Local Characteristic (LC) sector, Detailed Characteristic (DC) sector and Council Area (CA). For all other geographies statistical output for pre-defined tables and outputs will be best-fit from 2011 OA.

Census best-fit geographies

The Output Area (OA) is the smallest area for which census statistics (apart from population and household counts) are produced and the building brick for calculating statistics for any higher geography.

Almost all higher geographies used for census purposes are created by best-fitting census OAs, not postcodes, to the higher areas.

Council areas, Local Characteristic (LC) sectors and Detailed Characteristic (DC) sectors are the only census higher geography for which OAs form an exact-fit. Higher areas created from OAs may differ from higher areas created from postcodes.

Each OA is assigned to an area in a 'higher' geography by the master postcode of the OA. When dealing with census data, all the postcodes that form an OA are assigned to the same higher areas as the master postcode.

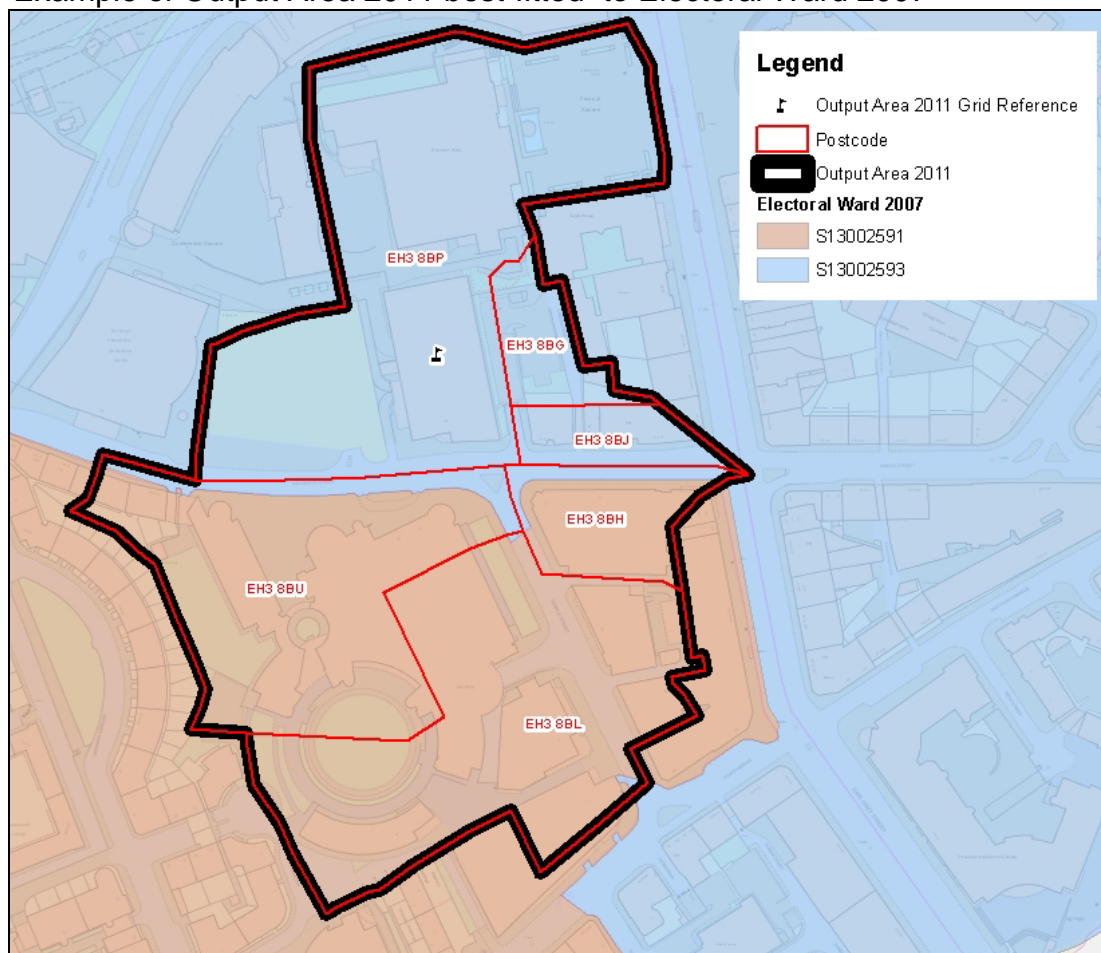
More information on master postcodes can be found in the 2011 Census Geography Background Information note within the [2011 Census Supporting Information](#) section of the NRS website.

2011 Census output geographies

Higher Area	Number of instances	Fit from 2011 Output Area
Council Area	32	Exact-fit
Scottish Parliamentary Region	8	Best-fit
Scottish Parliamentary Constituency	73	Best-fit
UK Parliament Constituency	59	Best-fit
Health Board	14	Best-fit
Community Health Care Partnership	34	Best-fit
Multi-member Electoral Ward	353	Best-fit
National Park	2	Best-fit
Local Characteristic Sector	1,012	Exact-fit
Detailed Characteristic Sector	866	Exact-fit
2010 Settlement	502	Best-fit
2010 Locality	629	Best-fit
Civil Parish	861	Best-fit
Inhabited Islands	56	Best-fit
2001 Data Zone	6,500	Best-fit

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Example of Output Area 2011 best-fitted to Electoral Ward 2007



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Output Area 2011 Postcode	Electoral Ward 2007
S00106914	S13002593
EH3 8BH	S13002593
EH3 8BL	S13002593
EH3 8BU	S13002593
EH3 8BG	S13002593
EH3 8BJ	S13002593
EH3 8BP	S13002593

In the example above, using the 'Point in Polygon' method, the output area (and the postcodes that make up the output area) have been assigned to an electoral ward using the master postcode of the OA.

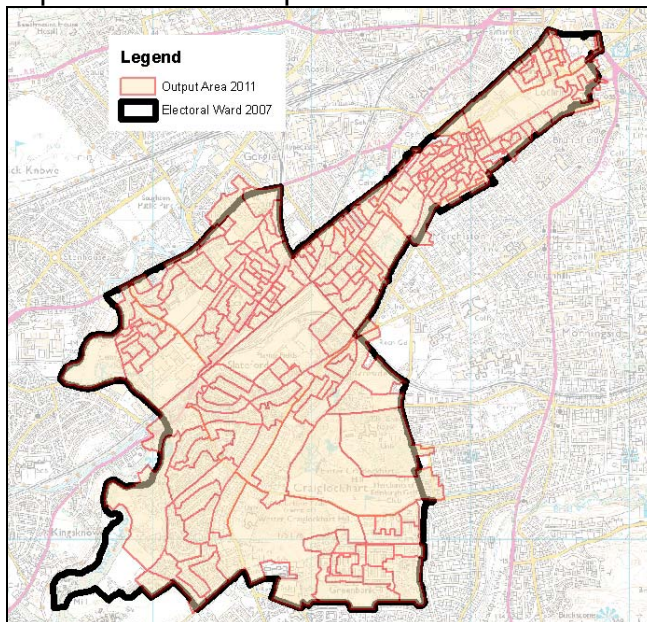
If you compare the electoral ward assignment from the OA (and the postcodes that comprise it) against the postcode assignment in the previous example, you will notice that three of the postcodes have been assigned to a different electoral ward. This illustrates the difference between referencing at postcode level and at OA level.

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Neither are incorrect; the difference is in the building brick geography used, which, for census statistics, cannot be smaller than output areas.

Each OA is assigned to an area in a 'higher' geography by the master postcode of the output area. When dealing with census data, all the postcodes that form an OA are assigned to the same higher areas as the master postcode.

Example of best-fit Output Area 2011 to Electoral Ward 2007



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Geographical boundaries

Postcodes and output areas are assigned to many different types of geographical boundaries, from administrative to electoral, health and so forth. These boundaries do not necessarily align and are subject to revision, or not as is the case for 2001 Data zone making it difficult to produce meaningful statistics especially over a period of time.

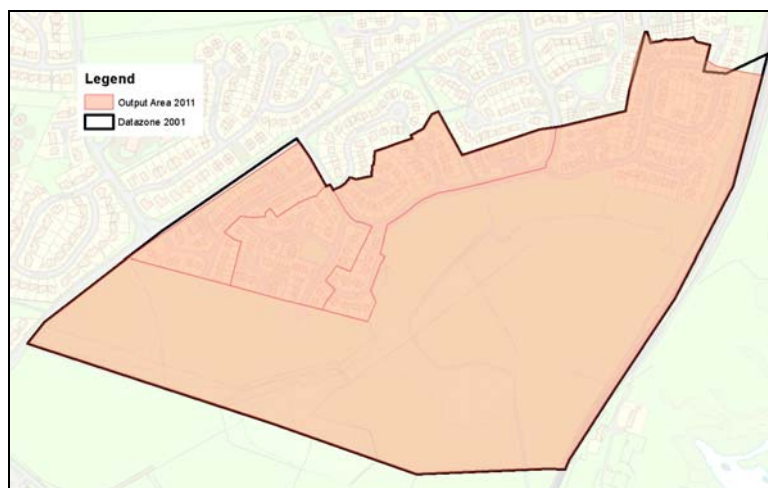
Postcodes, the building brick geography for census output areas, do not respect Scottish administrative or electoral boundaries. The allocation of addresses to postcodes by Royal Mail has much more to do with local geography, building development an operation efficiency and more often than not postcodes straddle these boundaries.

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Accuracy of best-fitted data

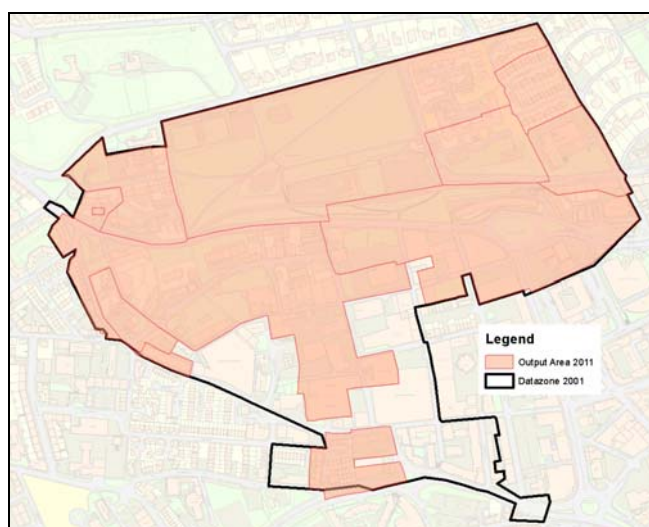
The difference between best-fit and exact-fit estimates will depend on the target geography. Generally, the bigger the target geography, the less difference there will be, meaning the best-fit allocation can be considered suitable for statistical analysis.

Data zones are one of the smallest geographies used for Census data. If there has been little change in an area between 2001 and 2011, generally the 2011 OAs best-fitted to 2001 Data zones will produce a good fit.



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However, in some cases, caution should be taken when analysing best-fitted statistics, particularly for some areas within the smaller geographies such as 2001 Data zones. For example, changes over time can mean that the best-fitted 2011 OAs do not accurately match the higher geography boundaries, such as in the example with a 2001 Data zone below.



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Time-series comparisons

Between 2001 and 2011, some underlying postcodes that make up an Output Area (OA) have changed in shape because addresses have been added or removed from the postcodes. Brand new postcodes have been added as a result of new or re-developments, and some postcodes will have been deleted as a result of demolitions.

The changes described above can result in differences between the 2001 and 2011 OA. In addition changes in populations of postcodes may have impacted the shape of the OA.

The process of creating 2011 OA began by assigning 2011 postcodes to the 2001 OA to create a candidate 2011 OA. The candidate OA:

- may not have met the minimum thresholds so will have been merged with a neighbouring OA; or
- may have become large enough to be split into two (or more) separate OAs for 2011.

Differences in the location of the weighted centroid of an OA may have resulted in a different postcode being chosen as the master postcode for an OA, meaning its higher area assignments may also have changed.

Data Zones

The 2001 data zone boundaries were produced as an exact-fit to 2001 OA. However, the changes described above mean that some 2011 OA form a best-fit to the 2001 data zones.

NRS Population and Migration branch have produced a report '2001 Data zones: Population and Household Estimates' which can be found on the [Small Area Population Estimates](#) section of the NRS website.

The report details the work carried out to compare population and household estimates in the 2001 and 2011 Censuses. The 2011 population and household estimates used in this report have been created from 2011 postcode estimates. Building up from 2011 postcode estimates to 2001 data zones gives best population estimate for the 2001 Data zone geography. It also provides a more 'like with like' basis to compare population and household estimates over time for these areas.